GEOLOGY IN SOIL SURVEY

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Table 1.

(From: Schoeneberger, et al. 1998. Field book for describing and sampling soils, version 1.1. National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE.)

Parent Material

Record the **Kind(s)** of unconsolidated material (regolith) from which the soil is derived. If the soil is derived directly from the underlying bedrock (e.g., granite), identify the **Parent Material** as either grus, saprolite, or residuum and then record the appropriate **Bedrock - Kind** choice. Multiple parent materials, if present, should be denoted; e.g., loess, over colluvium, over residuum. Use numerical prefixes in the **Horizon** designations to denote different parent materials (lithologic discontiniuities), e.g., A, BE, 2Bt, 3BC.

Kind - e.g., saprolite, loess, colluvium.

Kind [1]	Code PDP	Code NASIS	Kind [1]	Code PDP	Code NASIS
Eolian Deposits (non-volcanic)					
eolian deposit	E	EOD	loess, calcareous	--	CLO
eolian sands	S	EOS	loess, noncalcareous	--	NLO
loess	W	LOE	parna	--	PAR
Glacial Deposits					
drift	D	GDR	till, ablation	--	ATI
glaciofluvial deposit	--	GFD	till, basal	--	BTI
glaciolacustrine deposit	--	GLD	till, flow	--	FTI
glaciomarine deposit	--	GMD	till, lodgement	--	LTI
outwash	G	OTW	till, melt-out	--	MTI
supraglacial debris-flow	--	SGF	till, supraglacial	--	UTI
till T	TIL		till, supraglacial melt-out	--	PTI
In-Place Deposits (non-transported)					
grus [2]	--	GRU	saprolite [2]	--	SAP
residuum [2]	X	RES			
Mass Movement Deposits					
mass movement deposit	--	MMD	mudflow deposit	--	MFD
block glide deposit	--	BGD	rockfall avalanche dep.	--	RAD
colluvium	V	COL	rockfall deposit	--	RFD
creep deposit	--	CRP	rotational landslide dep.	--	RLD
debris avalanche deposit	--	DAD	scree	--	SCR
debris flow deposit	--	DFD	soil fall deposit	--	SFD
debris slide deposit	--	DSD	talus	--	TAL
earthflow deposit	--	EFD	topple deposit	--	TOD
lateral spread deposit	--	LSD			
Miscellaneous Deposits					
cryoturbate	--	CRY	mine spoil or earthy fill	F	MSE
diamicton	--	DIM			
Organic Deposits [5]					
coprogenic materials	--	COM	organic, grassy materials	--	OGM
diatomaceous earth	--	DIE	organic, herbaceous mat.	--	OHM
marl	--	MAR	organic, mossy materials	--	OMM
organic materials	O	ORM	organic, woody materials	--	OWM
Volcanic Deposits (unconsolidated; eolian and mass movement)					
ash (< 2 mm)	H	ASH	cinders (2-64 mm)	--	CIN
ash, acidic	--	ASA	lahar (volcaniclastic flow)	--	LAH
ash, andesitic	--	ASN	lapilli (2-64 mm, >2.0 sg [3])	--	LAP
ash, basaltic	--	ASB	pumice (< 1.0 sg [3])	--	PUM
ash, basic	--	ASC	scoria (> 2.0 sg [3])	--	SCO
ash flow (pyroclastic)	--	ASF	tephra (all ejecta)	--	TEP
bombs (> 64 mm)	--	BOM			
Water Laid or Transported Deposits					
alluvium	A	ALL	marine deposit	M	MAD
backswamp deposit	--	BSD	overbank deposit	--	OBD
beach sand	--	BES	pedisediment	--	PED
estuarine deposit	Z	ESD	slope alluvium	--	SAL
lacustrine deposit	L	LAD	valley side alluvium	--	VSA

[1] Parent material definitions are found in the "Glossary of Landforms and Geologic Terms", NSSH - Part 629 (Soil Survey Staff, 1998), or the "Glossary of Geology" (Jackson, 1997).

[2] Use the most precise term for the in situ material. Residuum is the most generic term.

[3] sg = specific gravity = the ratio of a material's density to that of water [weight in air / (weight in air - weight in water)].

[4] Cruden and Varnes, 1996.

[5] These generic terms refer to the dominant origin of the organic materials or deposits from which the organic soil has formed (i.e., parent material) (Soil Survey Staff, 1993). These terms partially overlap with those recognized in Soil Taxonomy (terms which refer primarily to what the organic material presently is); see the "Diagnostic Horizons Table" or "Properties Table".

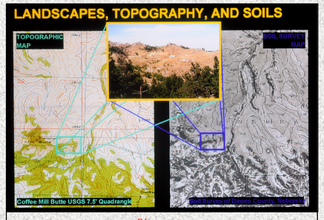

Photo 1.

Introduction

Geologic information, technologies, and concepts (Photo 1) are an historical and integral part of the National Cooperative Soil Survey Program (NCSS). Some of this information is used directly, whereas other information is adapted to a pedological perspective (Figure 1).

Inventory

The NCSS program focuses on identifying the **types**, **distribution**, and **properties** of soil-forming materials, and of adjacent materials that substantively affect the management of soils or land management decisions.

Materials: Geologic material (unconsolidated sediments or weathered rock) is the raw material comprising most soils. So-called Parent Material is the substrate in which soils develop and consists predominantly of traditional geologic categories (Table 1).

Distribution: The NCSS keys on the occurrence and arrangement of geologic materials to determine credible soil map units (Figure 2). New geologic information is shared with the appropriate state and university geologic communities.

Landforms: A major emphasis is placed on Landform identification (Figure 3) as a conduit for material identification and distribution. This information draws heavily from, but is not limited to, geologic conventions. This information involves OA/OC issues and directly affects NCSS Standards [e.g., Field book for Describing and Sampling Soils; Glossary of Landforms and Geologic Materials (National Soil Survey Handbook -- Part 629)], and national soil databases (i.e., NASIS).

Observation Opportunities: Typically, in the process of soil inventory, more numerous surficial observation locales are investigated than in geologic mapping. When properly conducted and recorded (Photo 2), this provides a useful package of surficial information for multiple applications.

Deep Investigations: Various circumstances (e.g., landform or material identification, site history, vadose zone issues) can require exploration of materials below the soil profile. Usually this involves unconsolidated surficial sediments. Various ongoing projects involve acquiring specific site information and in developing descriptive conventions (see handout).

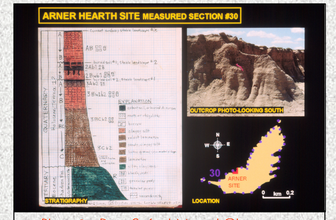

Photo 2. Deep Surficial Material Observations.

Management

Land management decisions are heavily influenced not only by soils information, but also by the nature and behavior of adjacent geologic materials.

Vadose Zone: Land management of nutrients, herbicides, and other inputs is directly affected by the movement of water through soil and near-surface materials (Figure 4). The NCSS focuses primarily on water movement dynamics above the permanent groundwater table (Figure 5).

Bedrock: The NCSS generally focuses on materials above the contact with consolidated bedrock. However, if the bedrock occurs close enough to the ground surface to affect land management choices (e.g., suitability for basements) observations are made and information recorded.

References

Natural Resource Conservation Service. 1999. Data Dictionary (current version) as contained in the National Soils Information System (NASIS). National Soil Survey Center, U.S. Department of Agriculture, Lincoln, NE.

Schoeneberger, P.J. and Wysocki, D.A. 1998. Geomorphic Description System (version 2.06). In: Schoeneberger, P.J., Wysocki, D.A., Benham E.C., and Broderson, W.D. 1998. Field book for describing and sampling soils, version 1.1. National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE.

Schoeneberger, P.J., Wysocki, D.A., Benham E.C., and Broderson, W.D. 1998. Field book for describing and sampling soils, version 1.1. National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE.

Soil Survey Staff. 1998. Glossary of landforms and geologic materials. Part 629, National Soil Survey Handbook, USDA, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.

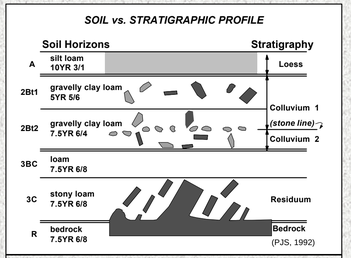

Figure 1. Pedologic and Geologic Context.

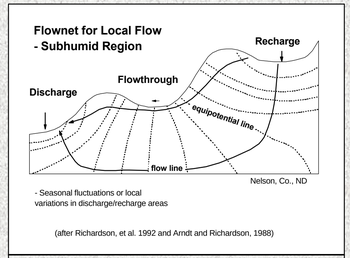

Figure 4. Water Movement through Soil & Near-Surface Materials.

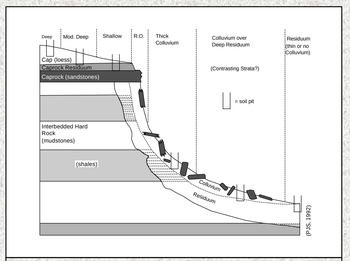

Figure 2. Soil Map Unit Development.

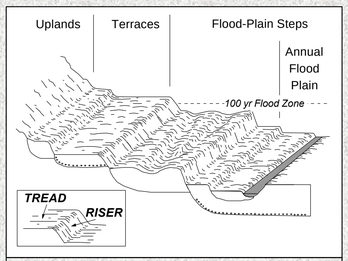

Figure 3. Landform Identification.

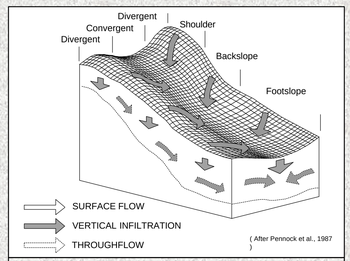

Figure 5. Water Movement Dynamics in the Vadose Zone.

Table 2

(From: Schoeneberger, et al. 1998. Field book for describing and sampling soils, version 1.1. National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE.)

Bedrock

Describe the nature of the continuous hard rock underlying the soil. Specify the **Kind**, **Fracture Interval**, **Hardness**, and **Weathering Class**.

Kind - e.g., limestone.

Kind	Code [1] PDP	Code [1] NASIS	Kind	Code [1] PDP	Code [1] NASIS
Igneous-Intrusive					
diabase	--	DIA	monzonite	--	MON
diorite	--	DIO	peridotite	--	PER
gabbro	--	GAB	pyroxenite	--	PYX
granite	I4	GRA	syenite	--	SYE
granodiorite	--	GRD	syenodiorite	--	SYD
Igneous-Extrusive					
aa (lava)	P8	AAL	pahoehoe (lava)	P9	PAH
andesite	I7	AND	pumice (flow, coherent)	E6	PUM
basalt	I6	BAS	rhyolite	--	RHY
dacite	--	DAC	scoria (coherent, mass)	E7	SCO
latite	--	LAT	trachyte	--	TRA
obsidian	--	OBS			
Igneous-Pyroclastic					
ignimbrite	--	IGN	tuff breccia	P7	TBR
pyroclastics (coherent)	P0	PYR	volcanic breccia	P4	VBR
tuff	P1	TUF	volcanic breccia, acidic	P5	AVB
tuff, acidic	P2	ATU	volcanic breccia, basic	P6	BVB
tuff, basic	P3	BTU			
Metamorphic					
amphibolite	--	AMP	metavolcanics	--	MVO
gneiss	M1	GNE	migmatite	--	MIG
granofels	--	GRF	mylonite	--	MYL
granulite	--	GRL	phyllite	--	PHY
greenstone	--	GRE	schist	M5	SCH
hornfels	--	HOR	serpentinite	M4	SER
marble	L2	MAR	slate	M8	SLA
metaconglomerate	--	MCN	soapstone (talc)	--	SPS
metaquartzite	M9	MQT			
Sedimentary-Clastics					
arenite	--	ARE	porcellanite	--	POR
argillite	--	ARG	sandstone	A0	SST
arkose	A2	ARK	sandstone, calcareous	A4	CSS
breccia, non-volcanic (angular fragments)	--	NBR	shale	H0	SHA
claystone	--	CST	shale, acid	--	ASH
conglomerate (rounded fragments)	C0	CON	shale, calcareous	H2	CSH
conglomerate, calcar.	C2	CCN	shale, clayey	H3	YSH
graywacke	--	GRY	siltstone	T0	SIS
mudstone	--	MUD	siltstone, calcareous	T2	CSI
orthoquartzite	--	OQT			
Evaporites, Organics, and Precipitates					
chalk	L1	CHA	limestone, arenaceous	L5	ALS
chert	--	CHE	limestone, argillaceous	L6	RLS
coal	--	COA	limestone, cherty	L7	CLS
dolomite	L3	DOL	limestone, phosphatic	L4	PLS
gypsum	--	GYP	travertine	--	TRV
limestone	L0	LST	tufa	--	TUA
Interbedded					
limestone-sandst.-shale	B1	LSS	sandstone-shale	B5	SSH
limestone-sandstone	B2	LSA	sandstone-siltstone	B6	SSI
limestone-shale	B3	LSH	shale-siltstone	B7	SHS
limestone-siltstone	B4	LSI			

[1] Definitions for bedrock are found in the "Glossary of Landforms and Geologic Terms", NSSH - Part 629 (Soil Survey Staff, 1998), and in the "Glossary of Geology" (Jackson, 1997).